

ABSTRACT OF THE DISCLOSURE

A separator is provided with a substrate portion having a predetermined concave-convex shape, an underlying coating layer formed on the substrate portion, a first coating layer coating the substrate portion and the underlying coating layer, and a second coating layer formed thereon. The second coating layer, which is formed from carbon materials, is sufficiently electrically conductive and protects the underlying layers. The first coating layer is formed from a low-melting-point metal subjected to a melting process. The melting process is a process of first conducting heating at such a temperature that melts the low-melting-point metal but does not melt the substrate portion and the underlying coating layer and then conducting cooling. Thus, in the first coating layer, the crystal grain size of the metal is increased and thus the grain boundary density is reduced.

[illegible]